

CLAIMS:

1. (Currently amended) A method of making at least one elongate spindle member having rigidity and stability against pressure and tensile loads as well as bending and torsional loads, whereby said spindle member acts between two objects, comprising the steps of

- ~~winding up~~ providing a plurality of mutually interlocking chain links (1, 12), ~~during axial displacement, into a helical winding (5, 16) to form said elongate spindle member,~~
- ~~—using, as the chain links, said~~ chain links being formed with a substantially circular curvature on exterior sides thereof and including associated engagement means for ~~providing the mutual interlocking of said the~~ chain links,
- drivingly connecting said chain links to a rotatable driving device (3,4;15,26) arranged in [[a]] at least one winding guide means (14) connected with one of said two objects,
- operating said driving device for rotation of said chain links in said winding guide means, said winding guide means being adapted for axial advancement of the plurality of chain links during said rotation to wind-up the plurality of chain links into at least one helical winding (5, 16) to form said elongate spindle member, [[-]] ~~guiding said chain links during rotation of said driving device in said winding guide means~~ so that the chain links are interconnected and retained in engagement by their associated engagement means with at least one neighboring chain link in the same turn as well as an adjacent chain link of said plurality of chain links in at least one neighboring turn of said elongate spindle member, and
- coupling the helical winding with the other of said two objects by means of a coupling member (6,18).

2. (Previously amended) A method according to claim 1, c h a r a c t e r i z e d by using a reversibly rotatable driving device (3,4; 15, 26) as said driving device to increase and reduce the length of the spindle member by rotation of said driving device in one and the other direction of rotation, respectively.

3. (Original) A method according to claim 2, c h a r a c t e r i z e d in that the coupling by means of said coupling member (6, 18) is effected by connection with the first produced turn of the helical winding.

4. (Currently amended) A method according to claim 2, c h a r a c t e r i z e d in that an additional elongate spindle member is formed concurrently with said at least one spindle member by using an additional plurality of chain links and an additional winding guide means for, ~~the two elongate spindle members (57, 58; 67, 68) being formed by winding-up individual coherent sets of chain links (59, 60) in two~~ an additional helical winding windings with opposite pitch direction ~~directions (65,66)~~ with respect to the pitch direction of said at least one helical winding, ~~the said additional~~ winding guide means ~~of said sets of chain links~~ being connected with ~~one and the other of said two objects, respectively.~~

5. (Previously amended) A method according to claim 3, c h a r a c t e r i z e d in that the two helical windings (57, 58) have the same diameter and that coupling members (63, 64) connected with the first produced turn (61, 62) of each winding are connected with each other intermediate said two objects.

6. (Previously amended) A method according to claim 2, c h a r a c t e r i z e d in that one of said helical windings (67) is advanced inside the other (68) and has chain links provided with an external threading (69) to engage an internal threading (70) in the chain links of the other helical winding to enable each of said helical windings to function as a coupling member for the other helical winding.

7. (Previously amended) A method according to claim 2, c h a r a c t e r i z e d in that a single spindle device is formed by winding two separate sets of chain links (76, 77) in alternating turns in the same helical winding, both sets of chain links (72, 73) being supplied to the same winding guide means.

8. (Previously amended) A method according to claim 2, c h a r a c t e r i z e d by using the method in a device for mutual height displacement of the two objects.

9. (Previously amended) A method according to claim 2, c h a r a c t e r i z e d by using the method for opening and closing either of windows and doors, in which said two objects are constituted by a stationary frame structure and an openable sash structure.

10. (Previously amended) A method according to claim 2, c h a r a c t e r i z e d by using the method for drilling, said coupling member being connected with either of a drill and cutter head.

11. (Previously amended) A method according to claim 2, c h a r a c t e r i z e d by using

the method for reversible mutual displacement of telescopically connected tube members.

12. (Currently amended) An apparatus for carrying out the method according to claim 1, comprising, in connection with one of said two objects, a chain storage (10) with an elongate chain (11) made of the said plurality of mutually interlocking chain links (12) having a substantially circular curvature on exterior sides and including associated engagement means, guide means (13) for advancing the elongate chain (11) from said chain storage (10) to said at least one, the winding guide means (14) ~~connected with the advancing guide means (13) and , the~~ at least one winding guide means comprising a guide (22) for engagement with a guide member (34) on the chain links for winding said at least one helical winding (16), ~~the said~~ rotatable driving device (3 , 4; 15 , 26) being rotatably arranged in said winding guide means (14) for axial advancement of the spindle device produced by the at least one helical winding (5) and the coupling member (6,18) for coupling ~~the~~ said at least one helical winding with the other of said two objects.

13. (Previously amended) An apparatus according to claim 12, characterized in that said coupling member (6, 18) is connected with an end turn of the helical winding.

14. (Previously amended) An apparatus according to claim 12, characterized in that the chain storage (10) comprises an elongate track connected with the advancing guide means (13) for receiving the chain (11) in its entire length.

15. (Previously amended) An apparatus according to claim 12, characterized in that the

chain storage is constituted of a winch connected with the advancing guide means, on which winch the elongate chain is wound.

16. (Previously amended) An apparatus according to claim 12, characterized in that the winding guide means (14) comprises a substantially part-cylindrical wall (21), on the interior side of which a guide (22) is provided for engagement with a guide member (34) on the chain links (12).

17. (Previously amended) An apparatus according to claim 16, characterized in that said guide is designed as at least one thread-rib (22) with a predetermined pitch across part of the interior side of said part-cylindrical wall (21).

18. (Previously amended) An apparatus according to claim 17, characterized in that the advancing guide means (13) comprises a substantially linear guide rail (20) for controlled advancement of the chain links (12) towards the winding guide means and a guide surface (19,24) for the exterior side (32) of the chain links, which guide surface is connected substantially in a tangential plane with the interior side of the part cylindrical wall (21) of the winding guide means, said guide surface (19, 24) having near its connection to said interior side at least one advancing guide member (25).

19. (Original) An apparatus according to claim 18, characterized in that the advancing guide member (25) comprises a member protruding from the advancing guide surface (24) for introducing each chain link (12) into the winding guide means (14) with an axial displacement

component.

20. (Previously amended) An apparatus according to claim 16, characterized in that the drive means comprises an advancing wheel (26), which is provided in a peripheral surface with a number of oblique teeth (27) having a predetermined second pitch directed opposite to the pitch of said thread-rib (22), said advancing wheel being journaled coaxially in the winding guide means (14) for engagement with the chain links (12) and being connected with a drive wheel (15) coupled to drive means via a transmission.

21. (Previously amended) An apparatus according to claim 13, characterized in that said coupling member (18) is designed as a substantially disc-shaped cover member with a substantially circular edge surface (51), in which a guide member (52) is provided for engagement with said guide (22) in the winding guide means (14), whereas the cover member is provided, on one side surface (53), with protruding engagement means (54) for engagement with each their respective chain link (12) in the first turn (17) formed in the helical winding (16).

22. (Original) An apparatus according to claim 21, characterized in that said protruding engagement means (54) comprises a hook member (55).

23. (Previously amended) An apparatus according to claim 21, characterized in that said protruding engagement means (54) comprises a groove (56).

24. (Previously amended) An apparatus according to claim 21, characterized in that said

guide member on the edge surface (51) of the coupling member (18) comprises a track (52) for receiving said thread-rib (22) in the winding guide means.

25. (Previously amended) An apparatus according to claim 12, characterized in that the helical winding (5) formed by the winding of the chain links (1) is surrounded by a casing (8) of variable length.

26. (Previously amended) An apparatus according to claim 25, characterized in that said casing is a bellows.

27. (Previously amended) An apparatus according to claim 12, characterized in that a chain storage, advancing guide means and winding guide means are provided in connection with each of said two objects for producing two elongate spindle members (57,58; 67, 68) by winding-up two helical windings with opposite pitch directions.

28. (Previously amended) An apparatus according to claims 13, characterized in that the two helical windings (57, 58) have the same diameter and that coupling members (63, 64) connected with the first produced turn (61, 62) of each winding are connected with each other intermediate said two objects.

29. (Previously amended) An apparatus according to claim 19, characterized in that one of said helical windings (67) is advanced inside the other (68) and has chain links provided with an external threading (69) to engage an internal threading (70) formed by said helical track in the

interior side of the chain links of the other helical winding (68) to enable each of said helical windings to function as a coupling member for the other helical winding.

30. (Previously amended) An apparatus according to claim 12, characterized in that a single spindle device (75) is formed comprising a helical winding of alternating turns of chain links (76,77) supplied from two separate sets of chain links.

31. (Previously amended) A device mutually displacing the height of the two objects comprising an apparatus according to claim 12.

32. (Previously amended) An operator device for opening and closing windows or doors comprising an apparatus according to claim 12, in which said two objects are constituted by a stationary frame structure and an openable sash structure.

33. (Previously amended) A drilling instrument comprising an apparatus according to claim 13, said coupling member being connected with a drill or cutter head.

34. (Previously amended) A device for reversible mutual displacement of telescopically connected tube members comprising an apparatus according to claim 12.

35. (Previously amended) An elongate chain comprising interlocking chain links (12) with associated engagement means for use in an apparatus according to claim 12, characterized in that each chain link (12) has a substantially circular curvature on exterior sides thereof and, in

unfolded projection, substantially the shape of a parallelogram with a first pair of engagement means (43, 44) for connection with at least one neighboring chain link in the same turn of the helical winding provided at a first pair of opposite sides (28, 29) and further engagement means (49, 50) for engagement with corresponding engagement means on an adjacent chain link in at least one neighboring turn of the helical winding provided at a second pair of opposite sides (30, 31).

36. (Previously amended) A chain according to claim 35, characterized in that each chain link (12) is in its exterior side (32) formed with a track (34) adapted to receive said thread-rib (22) in the winding guide means, said track forming with said first pair of opposite sides (28, 29) an angle (ν) adapted to said predetermined pitch.

37. (Previously amended) A chain according to claim 36, characterized in that an interior side (33) of each chain link (12) is formed with engagement means (45) for engagement with the substantially linear guide rail (20) in the advancing guide means (13) and that said exterior side of each chain link (12) is provided with a second guide member (35) for introducing the chain link (12) into the winding guide means (14) with an orifice (38) of said track (34) orientated towards a first end (23) of said thread-rib (22), said orifice opening in the downstream side (28) of said first pair of opposite sides with respect to the direction of advancement.

38. (Original) A chain according to claim 37, characterized in that said second guide member (35) comprises a second track provided in said exterior side and ending in said first pair of opposite sides (28, 29) in track orifices (36,37) displaced in a direction parallel to said first

pair of sides (28, 29).

39. (Previously amended) A chain according to claim 35, characterized in that a guide member (39) is formed in an interior side (33) of each chain link (12), said guide member (39) being designed as a helical track which on the interior side of the helical winding (16) formed by the chain links forms a number of coherent helical tracks (42) with said second pitch for engagement with individual ones of the oblique teeth (27) of the advancing wheel (26) of said driving device.

40. (Previously amended) A chain according to claim 37, characterized in that said engagement means (45) forms part of a second pair of engagement means (45, 47) provided at said first pair of opposite sides (28, 29) and being brought into engagement with opposite means on neighboring links in the same turn (17) by the winding of the chain links, to retain the chain links (12) in their positions in said winding.

41. (Previously amended) A chain according to claim 35, characterized in that the first pair of engagement means for each chain link (12) comprises a hook-shaped hinge member (44) and a curved track (43) for receiving said hinge member (44), respectively, said curved track (43) being adapted to receive the hook member (55) of said coupling member (18).

42. (Previously amended) A chain according to claim 40, characterized in that said second pair of engagement means for each chain link (12) comprises a fork member (45) provided at a free edge of a wall portion defining said curved track (43) for engagement, on one

hand, with said guide rail (20) in the advancing guide means (13) and, on the other hand, with a rib member (47) provided in an interior side of said hook-shaped hinge member (44), said fork and rib members (45, 47) preventing mutual displacement of neighboring chain links in the same turn in the axial direction of the helical winding by engagement with a rib member (47) and a fork member (45), respectively, on each of respective neighboring chain links, the hook-shaped hinge member (44) being provided, on each side of said rib member (47), with abutment surfaces (48a, 48b) serving as a stop for branches (45a) of said fork member (45) for retaining neighboring chain links in a predetermined angular position in said turn.

43. (Previously amended) A chain according to claim 42, characterized in that said mutually engaging fork and rib members (45, 47) are positioned in such a way relative to one another that said curved tracks (43) on a chain link (12) are brought into engagement with hook-shaped hinge members (44) in chain links positioned side by side in the same turn and a neighboring turn.

44. (Previously amended) A chain according to claim 35, characterized in that said further engagement means comprises a track (49) in the exterior side (32) of the chain link (12) and a rib member (50) along one side and the other, respectively, of said second pair of opposite sides (30, 31), said rib member (50) being adapted to engage the groove (56) on said coupling member (18).

45. (Previously amended) A chain according to claim 35, characterized in that each chain link (12) has a length different from an even fraction of a circle having the radius of said

helical winding.

46. (Original) A chain according to claim 45, characterized in that the length of each chain link (12) constitutes an odd fraction of a circle.

47. (Original) An apparatus according to claim 46, characterized in that the length of each chain link (12) constitutes a fifth of the peripheral length of the interior wall side of the winding guide means (14).

48. (Previously amended) A chain according to claim 35, characterized in that the chain links (12) are molded from plastics material.

49. (Previously amended) A chain according to claim 35, characterized in that the chain links (12) are made as cast or sintered metal bodies.